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**Propulsion Research Program**  
*Propellant Performance Calculation Program*

**SEMIANNUAL TECHNICAL REPORT**  
*(1 January - 30 June 1962)*

**31 AUGUST 1962**

*Prepared by P. C. HANZEL*  
*Aerodynamics and Propulsion Research Laboratory*

*Prepared for* **DEPUTY COMMANDER AEROSPACE SYSTEMS**

**AIR FORCE SYSTEMS COMMAND**

**UNITED STATES AIR FORCE**

*Inglewood, California*

408 918



LABORATORIES DIVISION •

**AEROSPACE CORPORATION**  
**CONTRACT NO. AF 04(695)-69**

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① DCAS TDR 62 161

Report No.  
④ TDR 69 2210 07 TR 2

⑥ PROPULSION RESEARCH PROGRAM.  
Propellant Performance Calculation Program.

④ SEMIANNUAL TECHNICAL REPORT  
(1 January - 30 June 1962),

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P. C. Hanzel  
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El Segundo, California

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① NA  
⑤ NA  
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TDR-69(2210-07)TR-2

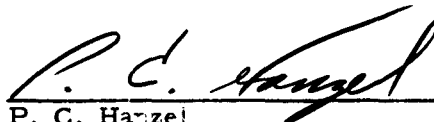
PROPULSION RESEARCH PROGRAM

Propellant Performance Calculation Program

SEMIANNUAL TECHNICAL REPORT

(1 January - 30 June 1962)

Prepared



P. C. Hanzel  
Chemical Propulsion Department

Approved



J. G. Logan, Director  
Aerodynamics and Propulsion Research  
Laboratory

AEROSPACE CORPORATION  
El Segundo, California

# **ABSTRACT**

→ The results of ~~the~~ computer program for the calculation of theoretical performance of rocket propellants are <sup>reported to be</sup> in good agreement with values computed by other programs for selected simple propellant formulations. Data for some 500 products of reaction among eighteen chemical elements <sup>indicated as being</sup> are ~~now~~ available for use in these calculations. An ~~im~~ <sup>extended</sup> ~~proved~~ version of the program is in preparation for external distribution. ←

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## I. INTRODUCTION

The computer program has been used for calculation of the theoretical performance of rocket propellants. Values of computed results are in good agreement with those obtained using other programs employing the JANAF data. The writing of a somewhat more extended version of this program is nearing completion. The extended version is expected to be made available for external distribution.

## II. DISCUSSION

The program capabilities are essentially those described in the Semiannual Technical Report of 2 February 1962.\*

Intensive checkout of the program is in progress, employing the most difficult problems, in an attempt to find those areas where the computer program will currently fail to provide a solution to thermodynamic problems. Such areas have been found and to date have been corrected by minor changes in the Fortran program. These changes usually involve fine adjustment in convergence criteria to ensure maximum accuracy, combined with a capability of reaching a solution to an arbitrary thermodynamic problem. Occasionally, an error in logic, to be expected in a computer program of this magnitude, has been found and corrected. The program will be released when a high confidence level of capability is attained.

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\*Hanzel, P. C., "Propulsion Research Program: Propellant Performance Calculation Program, Semiannual Technical Report," (1 July - 31 December 1961). Report No. TDR-930(2210-07)TR-1. Aerospace Corporation, El Segundo, California, 2 February 1962.



The speed of the machine program is less than had been anticipated, but it is expected to increase once certain empirical forcing parameters are better determined.

International Business Machine data cards are now available for the program for some 500 products of reaction involving the elements of hydrogen, helium, lithium, beryllium, boron, carbon, nitrogen, oxygen, fluorine, sodium, magnesium, aluminum, silicon, sulfur, chlorine, potassium, bromine, and iodine.

The extended version of this program, which is nearing completion, will be checked against the current version when applicable, then fully documented for release. Thermodynamic data will continue to be collected for future use. The calculation of propellant performance will continue.

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